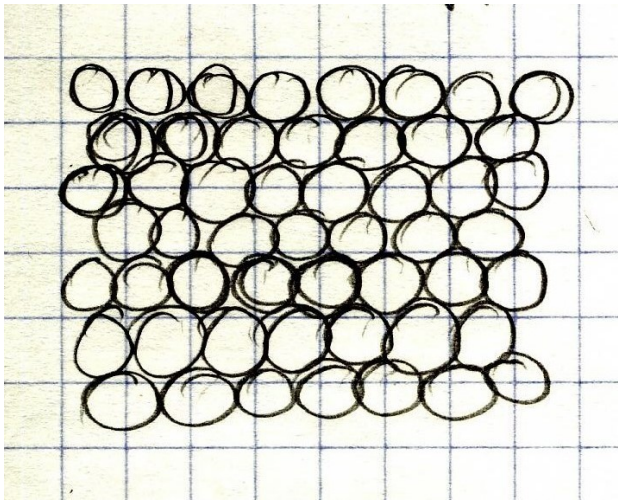
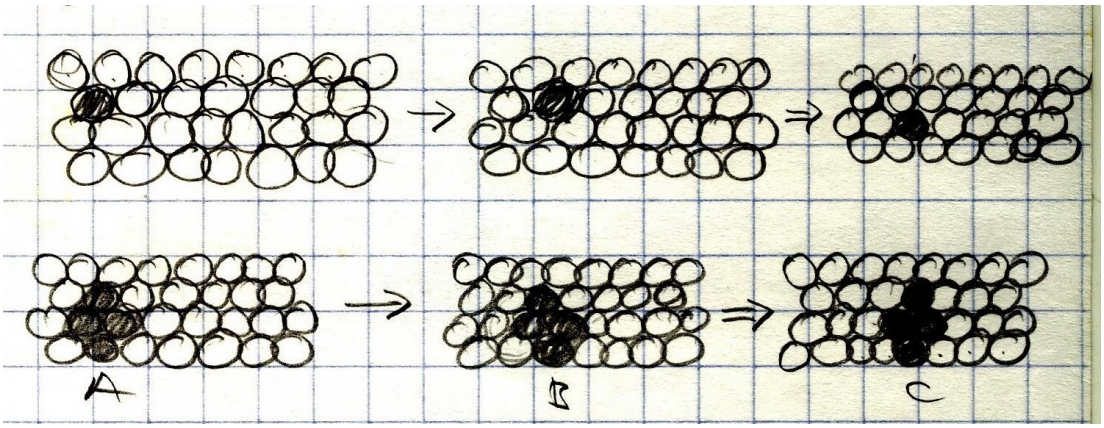
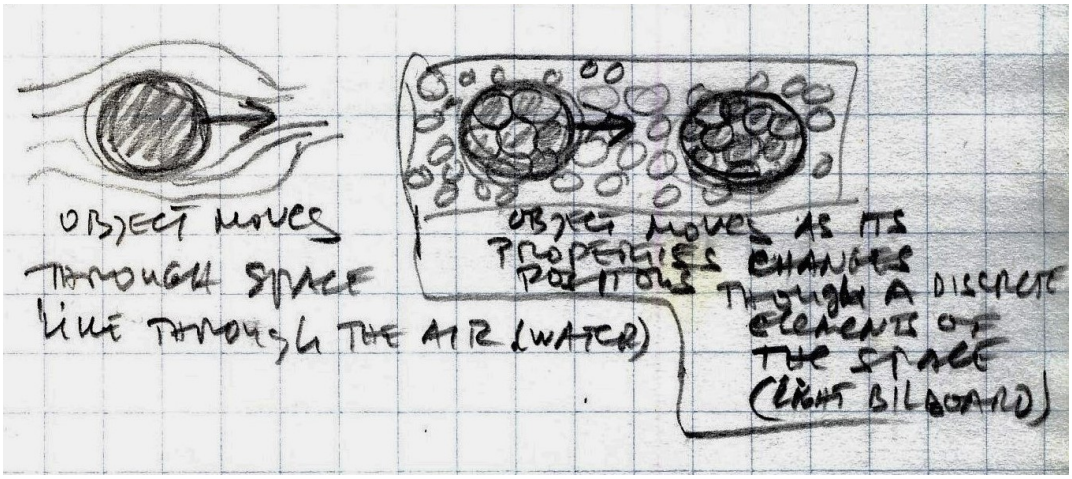
Musings on the Planck Length Universe

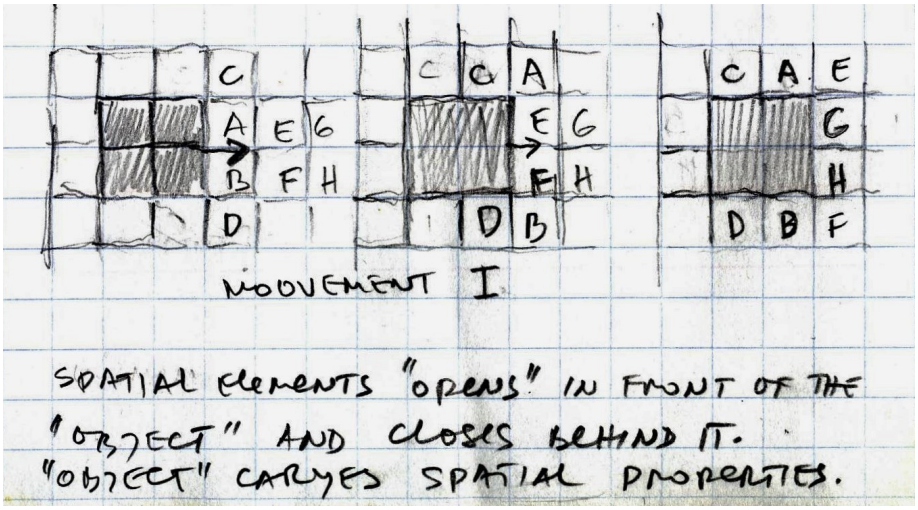
-How does matter, or how does a change move through space on the micro-level? The answer depends on how the structure of space and matter are defined at a certain order of magnitude and what are their properties at that level. We will assume that, on the micro-level, the limits of space are discrete, consisting of the smallest units possible. Therefore, in order to define the structure of space on this level it would be necessary to introduce a notion of an "elementary spatial unit" (ESU), the smallest part of space, some kind of spatial "atom". This would be the smallest and indivisible finite part (cell) of space, defined only by size and position (neighborhoods). It doesn't have any content, but it could be filled with some property like "matter" or "vacuum".



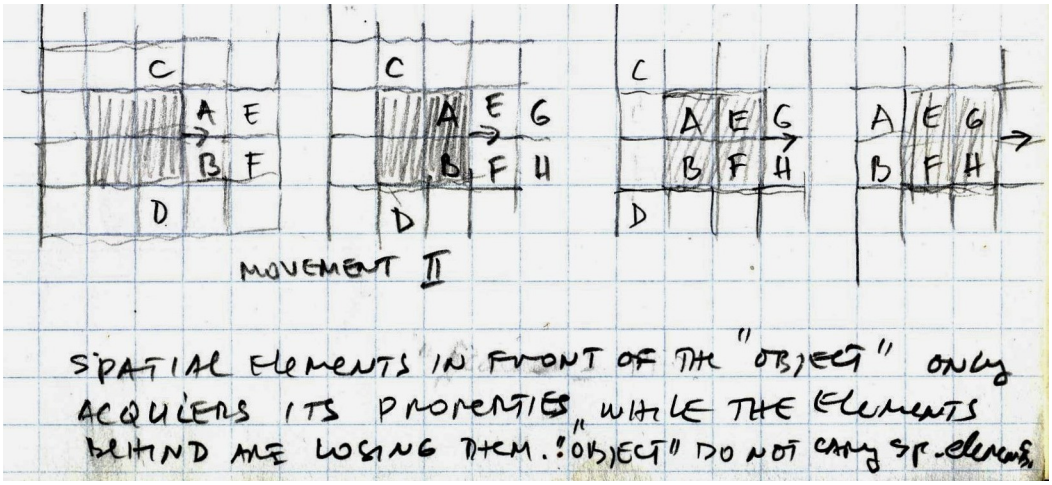



OBJECT MOVES THROUGH SPACE LIKE THROUGH THE AIR (WATER)
OBJECT MOVES AS ITS PROPERTIES CHANGES POSITIONS THROUGH A DISCRETE ELEMENTS OF THE SPACE (LIGHT BILLBOARD)

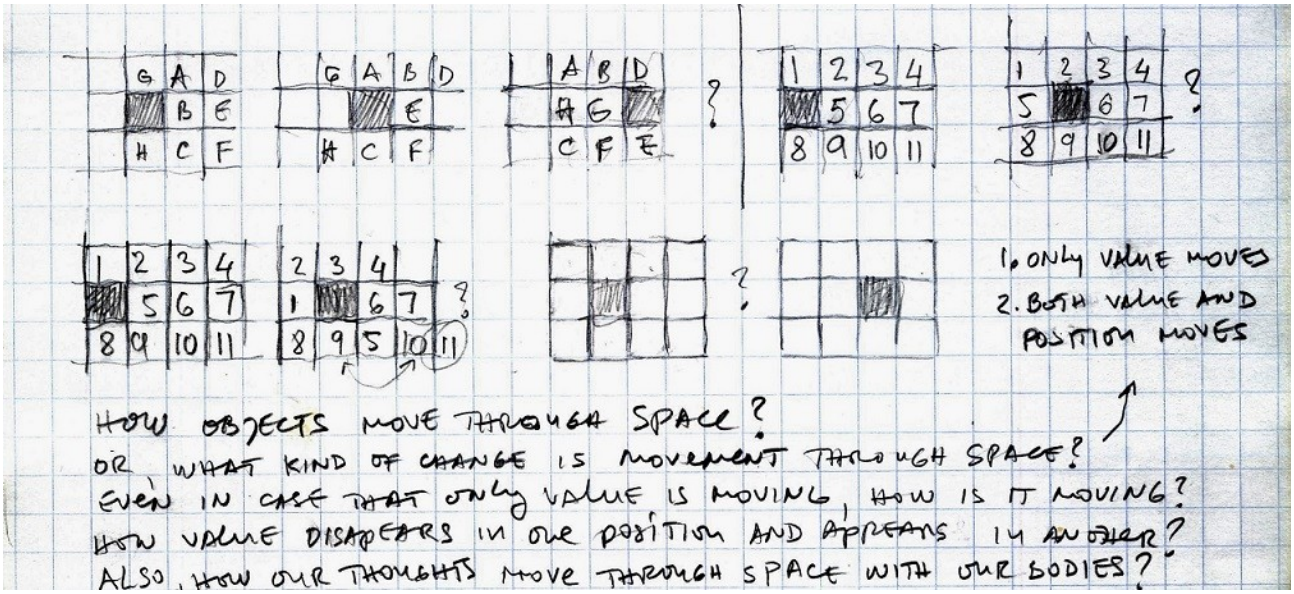
There are two possibilities in which a property can to move through space (change its position). One would be that an ESU itself, containing a certain property, moves between other ESU carrying its content like a fish moving through the water or a ball through the air.



Another possibility would be that the positions of all the ESU don't change while their content is moving. This would be like an old billboard covered with light bulbs, or a screen with pixels. The positions of the bulbs or pixels are fixed, and only their content (light) changes position from one bulb to the other. Here the spatial structure (the structure of positions) is fixed and it is only the property (the content) that changes positions, thus moving through space.


MOVEMENT II
SPATIAL ELEMENTS IN FRONT OF THE "OBJECT" ONLY ACQUIERS ITS PROPERTIES, WHILE THE ELEMENTS BEHIND ARE LOSING THEM. "OBJECT" DO NOT CARRY SP. ELEMENTS

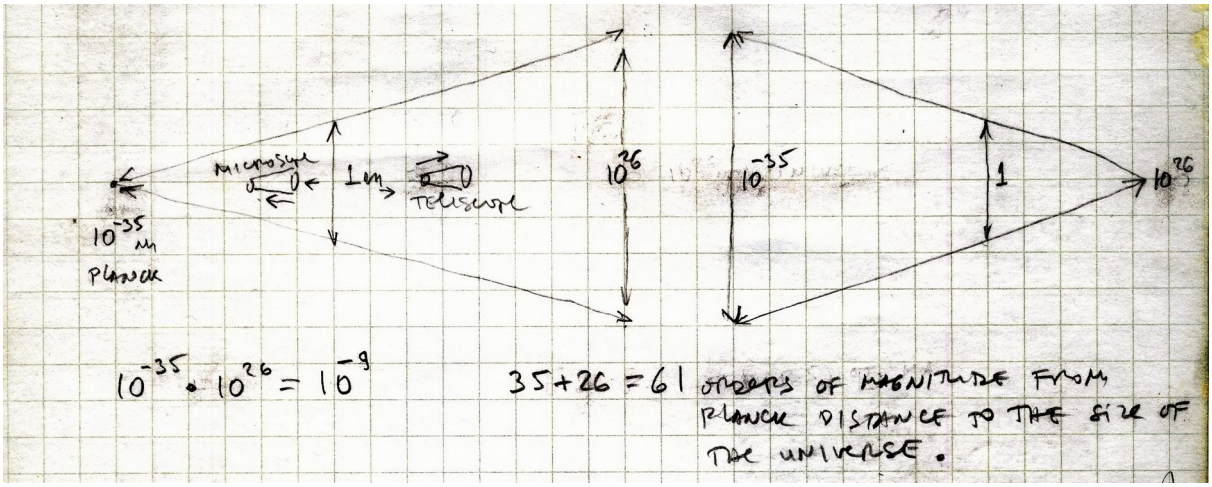
We will adopt this second model and assume that these smallest spatial units don't change their positions, just their content. Motion occurs when a property that occupies a certain spatial unit disappears (leaves it) and appears in another unit (position).


1. ONLY VALUE MOVES
2. BOTH VALUE AND POSITION MOVES
HOW OBJECTS MOVE THROUGH SPACE?
OR WHAT KIND OF CHANGE IS MOVEMENT THROUGH SPACE?
EVEN IN CASE THAT ONLY VALUE IS MOVING, HOW IS IT MOVING?
HOW VALUE DISAPPEARS IN ONE POSITION AND APPEARS IN ANOTHER?
ALSO, HOW OUR THOUGHTS MOVE THROUGH SPACE WITH OUR BODIES?

If the property 'black' at position x disappears and appears on another (y), it would then look as though 'black' moved from x to y, while the property 'white' moved from y to x. We could imagine this to describe the way in which, for example, matter moves through space (vacuum).

-One possible size of the spatial unit could be based on the Planck length that is 1.6 x 10^{-35}m or about 10^{-20} orders of magnitude smaller than a proton. Since the size of the entire observable universe is 8.8×10^{26} m, the size of a

protein 6.9×10^{-9} is in the middle between the Planck length and the universe. In other words, how the universe appears from the protein scale is how the protein appears from the Planck scale. Thus, it seems that the size of the first living molecule that appeared on Earth was exactly in the middle between the largest and the smallest entities in the universe known or imagined so far.

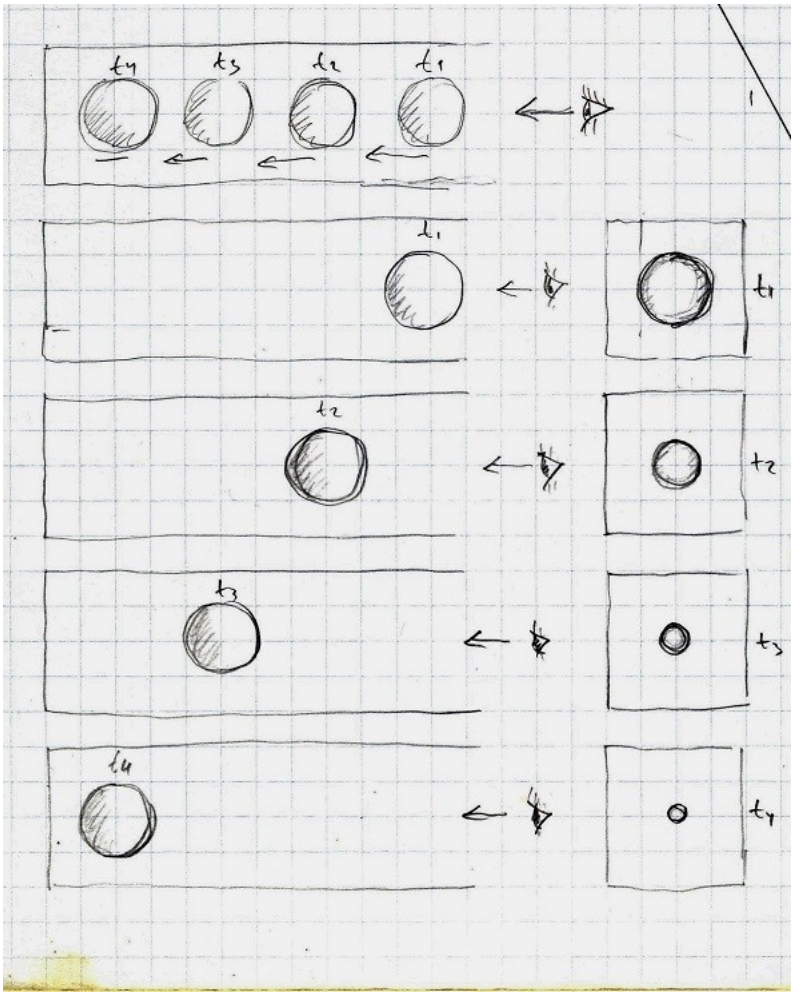


-For a human size observer (1.5×10^{0} m) the Planck length is at an entirely unreachable scale. Without even thinking how many of these smallest spatial units there are in the entire universe, we could just try to imagine how an electron or quark or a neutrino, even a photon, might look at that level, or from that level. How would an electron the size of 10^{-18}m move through space on the Planck length level which is 17 orders of magnitude smaller? Even a neutrino the size of 10^{-24} m is 11 orders of magnitude larger. We should keep in mind that the human scale is "only" 12 orders of magnitude smaller than the diameter of the entire Solar system. It is clear that on that scale neither electron nor neutrino could appear as homogeneous particles/entities. Furthermore, it is questionable if on the Planck scale level some basic notions like space, time, matter, or energy, would even make any sense.

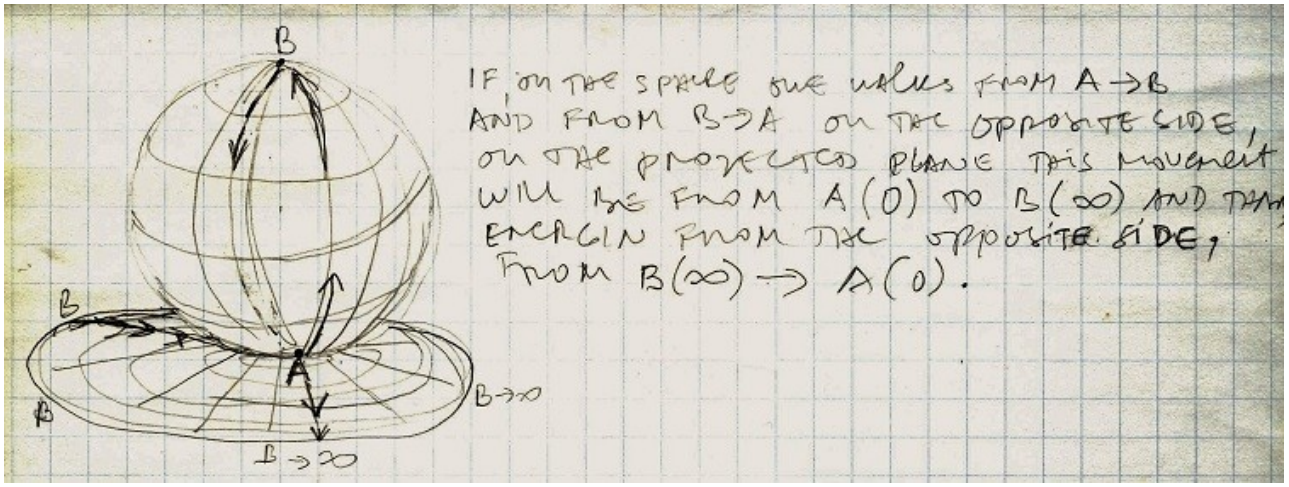
-All observations we make with our eyes or indirectly through a telescope or microscope are based on light and its properties, and it is almost certain that at the Planck length level, light as an observation tool would be of no use. From that position the notion of "microscope" would not make sense even if it might be possible to imagine some kind of analogous instrument and corresponding observer. Similarly, from the opposite position which is at the

scale of the entire visible universe (10^{26}m), there is no room for a meaningful concept of a “telescope”. This would imply that in this concept of the universe there are no infinities, neither infinitely small nor (most likely) infinitely large. There are only very, very small and very, very large spatial units in relation to the referential, human scale, observer. Similarly, there are no time-based infinities, both the infinitely short time unit and the infinitely long time unit are called eternity. The very small time unit would correspond to the Planck-length ($1x10^{-35}$sec) while the longest time unit would correspond to the scale of the visible universe ($4x10^{17}$sec)

- On the human scale, the properties of space seem to be well known. For example, if an object moves through space it will continue to move in a straight line indefinitely if there is no force acted upon it. And if this object is moving away from us it will also appear to be shrinking with distance. A reasonable explanation is that this is an illusion, since we assume that the actual size of the object is in fact not changing, it is not getting smaller



-However, another explanation could be that the object is really getting smaller by moving away from us, and that it is the nature of space itself. If we accept this explanation, then what we are looking at in the distance is shrinking space and the farther we look the smaller and smaller we see it become. We could even imagine that the “micro” space we see through the microscope and the “macro” space we see through the telescope might be meeting (merging) at some faraway point or area we usually call infinity. In that case growing orders of magnitude will have exponents with a negative sign. Even if this assumption makes some sense, it is clear that the properties of space in these two shrinking directions are very different. One being obvious: while we can only look but not move through “micro” space, we could look and move through “macro” space.



-If we consider the case of Riemann’s sphere, our current interpretation of the universe corresponds to the horizontal 2D plane on which the sphere is projected. Perhaps the more accurate parallel would be the sphere itself. Here, point A would represent the level of the smallest spatial units (Planck length), the middle would be the scale of a protein and from there space would converge toward the top point of the sphere – B representing here the infinity. It might make sense to structure the entire spectrum of orders of magnitude from 10-35 to 1026 in sections of 12 and thus get five parallel universes that are connected and have some similarities, but also have some very different properties

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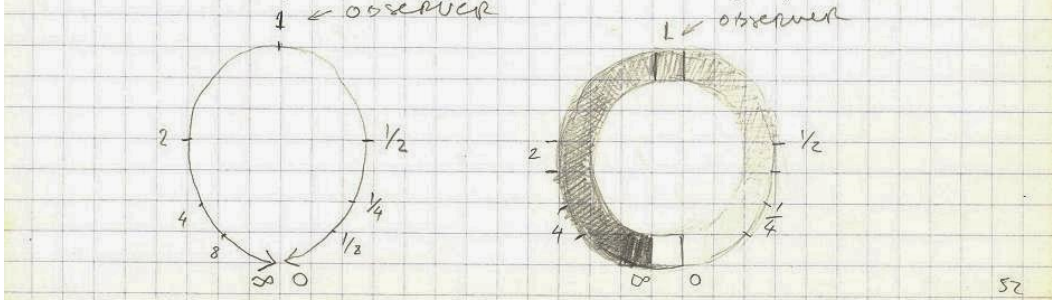
THE SMALLEST AND THE FARTHEST POINTS OF THE UNIVERSE MUST BE ONE (THE SAME) POINT!



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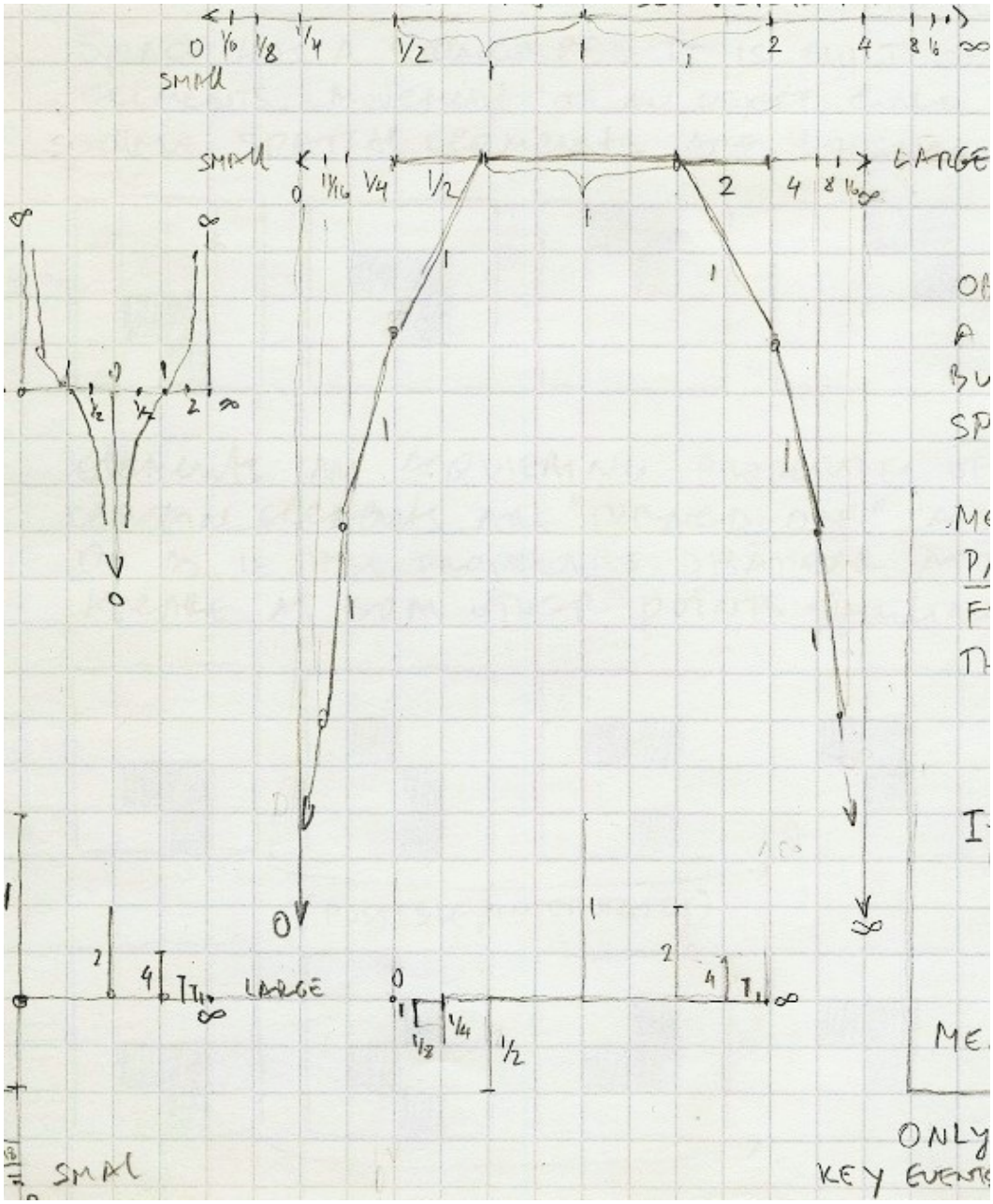

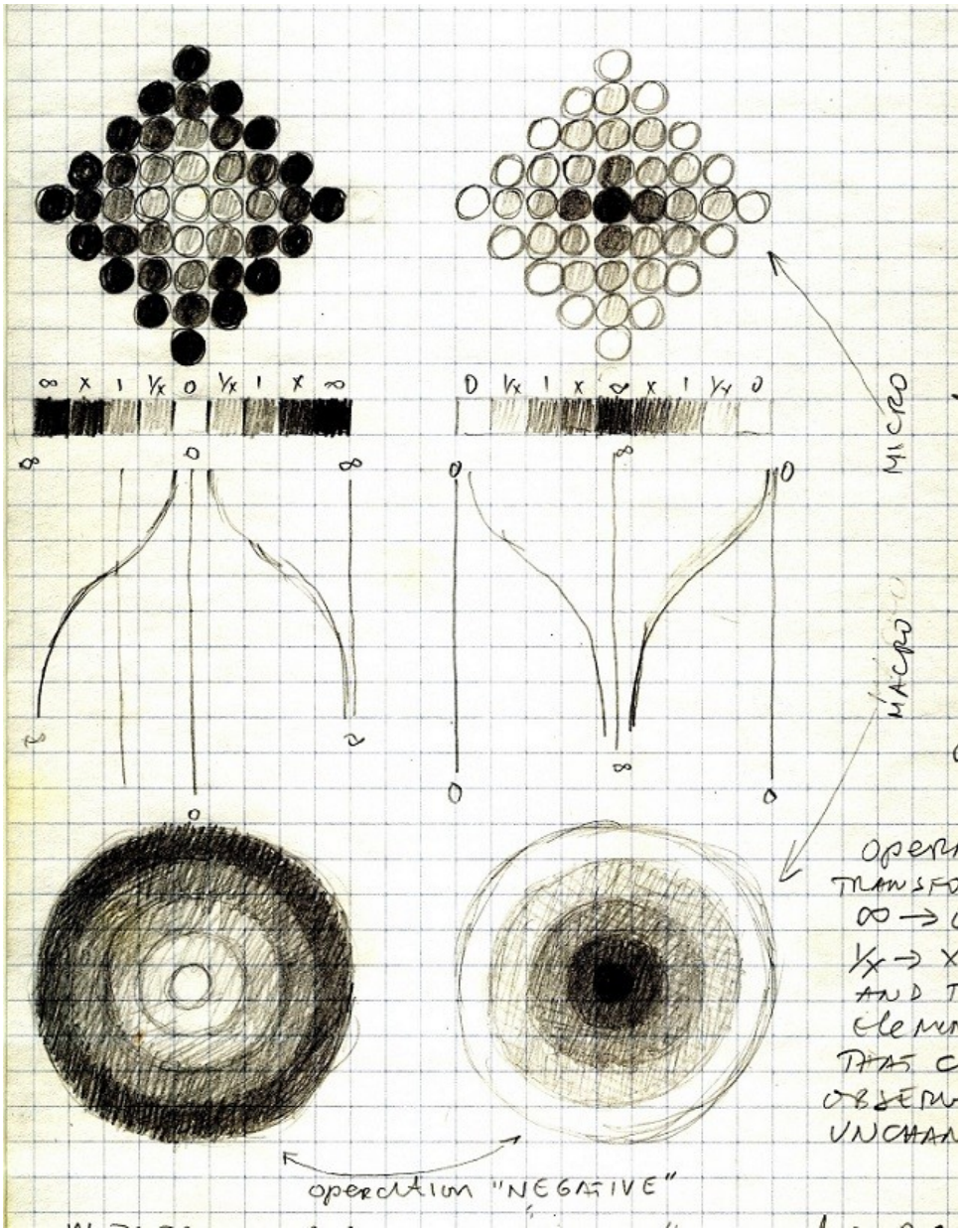

-In order to be able to imagine some possible properties of space at the Planck length level we need to define an “observer” which would be somewhere between 5-6 orders of magnitude larger than the elementary spatial unit. This “observer” ought to have some means of “observing” the space around it the way we observe the world around us. There has to be some kind of interaction between the observer and the environment, either spatial elements sending out (radiating) some kind of “change” that the observer could register, or the observer emitting a “change” that would then

reflect from what is being observed and recorded when it comes back. Whatever the nature of the reflection might be, its unit could not be smaller than the Planck length, meaning that some kind of "uncertainty principle" most likely might have to apply. In other words, it seems it would not be possible to imagine an accurate observation in which the observed "object" and the "change," that mediates between the "object" and the "observer," are of the same order of magnitude.

-An interesting question here might be how the "uncertainty principle" itself relates to different scales of observers. For example, an observer that is the size of an atom and with a referential time unit of 10^{-12} sec. Perhaps that observer would be able to record ("see") at the same time both the position and the momentum of an electron hit by a photon the way we could see a van being hit by a cannon ball. However, while we as observers could use the light to see the van and the canon ball without disturbing the event, what might be the medium that would convey to this tiny observer the photon-electron collision without disturbing it? In fact, even a human scale observer would be able to observe both position and momentum in photon-electron collision if there is an instrument based on some kind of medium("particle") many orders of magnitude smaller than a photon that can be thrown at the event(collision) undisturbing it and then caught back.

Argos Panopty Berlin, February 2020